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TO
CANADIAN PALÆONTOLOGY

VOLUME II.

PART III.

CANADIAN FOSSIL INSECTS

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5. Insects from the Tertiary Lake Deposits of the southern interior of British Columbia, collected by Mr. Lawrence M. Lambe, in 1906.

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INTRODUCTORY.

The Tertiary insects described in this memoir were collected by Mr. Lawrence M. Lambe, in 1906, from Tertiary lake deposits in southern British Columbia. Dr. Anton Handlirsch, Adjunct Curator of the Royal Imperial Natural History Museum, Vienna, very kindly undertook the investigation of this material. The results of his investigation, together with 36 drawings of the fossils examined, are embodied in the present report, submitted by Dr. Handlirsch, and translated by Miss Lucy P. Bush, New Haven, Connecticut, U.S.A.

(Signed) R. W. Brock.

Ottawa, June 6, 1910.

CONTENTS.

INTRODUCTORY— PAGE.

Tertiary insects of British Columbia arranged into systematic groups.. 93
Number of species in the respective groups.. 93
Names of known British Columbia species.. 94
Geographical distribution of Tertiary Insects throughout the world.. 96
Ancient climatic conditions of Similkameen River region deduced from entomological fossils found there.. 96
Oligocene age of Similkameen River region determined.. 96

DESCRIPTION OF SPECIMENS EXAMINED, ETC.—

ORTHOPTERA.. 97
Acridioidæ.. 97
Acridioiea.. 97
COLEOPTERA.. 98
Carabidæ.. 98
Nebria paleomelas, Scudder. (Nicola river).. 98
Elateridæ.. 98
Cryptohypnus? terrestris, Scudder. (Nicola river).. 98
Limonius impunctus, Scudder (Similkameen).. 98
Elaterites, sp., Scudder. (Similkamen).. 98
Elateridæ, Scudder. (Nicola river).. 98
Elater (undetermined), Lambe. (Tulameen river).. 98
Buprestidæ.. 98
Buprestis sepulta, Scudder. (Nicola river).. 98
Buprestis saxigena, Scudder. (Nicola river).. 98
Buprestis tertiaria, Scudder. (Nicola river).. 98
Hydrophilidæ.. 98
Cercyon? terrigena, Scudder. (Nicola river).. 98
Nitidulidæ.. 98
Prometopia depilis, Scudder. (Quesnel).. 98
Tenebrionidæ.. 98
Tenebrio primigenius, Scudder. (Ninemile creek).. 98
Chrysomeridæ. 98
Cryptocephalus punctatus, Scudder. (Similkameen).. 98
Galerucella picea, Scudder. (Ninemile creek).. 98
Microrhopala, sp., Chagnon. (Vancouver island).. 98
Scarabaeidæ.. 99
Trox oustaleti, Scudder. (Ninemile creek).. 99
(a) Undefined specimens, Lambe. (Tulameen river).. 99
(b) " " " " " 99
(c) " " " (Horsefly mine).. 99
HYMENOPTERA.. 99
Ichneumonidæ (Pimplaria).. 99
Xylonomus lambei, Handlirsch. (Tranquille river).. 99
Pimpla saxea, Scudder. (Quesnel).. 100
Pimpla senecta, Scudder. (Quesnel).. 100
Pimpla decessa, Scudder. (Quesnel).. 100

— PAGE.
Braconidæ .. 100
Calyptites antediluvianus, Scudder. (Quesnel) .. 100
Bracon............, Scudder. (Similkameen) .. 100
Formicidæ .. 100
Formica arcana, Scudder. (Quesnel) .. 100
Dolichoderus obliteratus, Scudder. (Quesnel) .. 100
Aphænogaster longæva, Scudder. (Quesnel) .. 100
ODONATA .. 100
Undetermined specimen, Scudder .. 100
RHAPHIDIOIDEA .. 100
Archiinocellia oligoneura, Handlirsch. (Horsefly mine) .. 100
Reasons for inventing three new names of genera: (1) Dictyoraphidia, (2) Archiinocellia, and (3) Archiraphidia—of the species *Rhaphidioidea* .. 101
List of all the known fossil Rhaphidians .. 104
Megaraphidia elegans, Cockerell .. 104
Dictyoraphidia veterana, Scudder .. 104
Archiinocellia oligoneura, Handlirsch .. 104
Archiraphidia tranquilla, Scudder .. 104
Archiraphidia eventa, Scudder .. 104
Inocellia erigena, Scudder .. 104
Inocellia somnolenta, Scudder .. 104
Rhapidia (larva), Menge .. 104
NEUROPTERA .. 104
Hemerobiidæ .. 104
Bothromicromus lachlani, Scudder. (Quesnel) .. 104
DIPTERA .. 104
Mycetophilidæ .. 104
Sciara deperdita, Scudder. (Quesnel) .. 104
Boletina sepulta, Scudder. (Quesnel) .. 104
Brachypeza abita, Scudder. (Quesnel) .. 104
Brachypeza procera, Scudder. (Quesnel) .. 104
Trichonta dawsoni, Scudder. (Quesnel) .. 104
Bibionidæ .. 104
Penthetria angustipennis, Handlirsch. (Horsefly mine) .. 104
Penthetria pulla, Handlirsch. (Tulameen river) .. 105
Penthetria brevipes, Handlirsch. (Tulameen river) .. 106
(a) Penthetria pictipennis, Handlirsch. (Tulameen river) .. 106
(b) Penthetria? pictipennis, Handlirsch. (Tulameen river) .. 107
(c) Penthetria? pictipennis, Handlirsch. (Tulameen river) .. 108
Penthetria elatior, Handlirsch. (Tulameen river) .. 108
Penthetria reducta, Handlirsch. (Horsefly mine) .. 109
Penthetria falcatula, Handlirsch. (Tulameen river) .. 110
Penthetria fragmentum, Handlirsch. (Horsefly mine) .. 111
(a) Penthetria nana, Handlirsch. (Tulameen river) .. 111
(b) Penthetria nana, Handlirsch. (Tulameen river) .. 112
Penthetria separanda, Handlirsch. (Tulameen river) .. 112
Penthetria pulchra, Handlirsch. (Tulameen river) .. 113
(a) Penthetria avunculus, Handlirsch. (Tulameen river) .. 114
(b) Penthetria avunculus, Handlirsch. (Tulameen river) .. 115
Penthetria avus, Handlirsch. (Tulameen river) .. 115

PAGE.
Penthetria lambei, Handlirsch. (Tulameen river) 116
Penthetria ovalis, Handlirsch. (Tulameen river) 117
Penthetria transitoria, Handlirsch. (Tulameen river) 117
Penthetria canadensis, Handlirsch. (Tulameen river) 118
Penthetria curtula, Handlirsch. (Tulameen river) 119
Penthetria dilatata, Handlirsch. (Horsefly mine) 120
Penthetria platyptera, Handlirsch. (Horsefly mine) 121
Ptychopteridæ 122
Etoptychoptera tertiaria, Handlirsch. (Tulameen river) 122
Chironomidæ 123
Undefined chironomids, Scudder. 1877. (Quesnel) 123
Tipulidæ 123
Tipula tulameen, Handlirsch, 1879. (Tulameen river) 123
Asilidæ 124
Undefined specimen, Scudder. 1879 124
Empidæ 124
Microphorus defunctus, Handlirsch. (Tulameen river) 124
Dolichopodidæ 126
Dolichopus, sp., Scudder. (Quesnel) 126
Borboridæ 126
Heteromyza senelis, Scudder. (Quesnel) 126
Sciomyza revelata, Scudder (Quesnel) 126
Lonchaea senescens, Scudder. (Quesnel) 126
Palloptera morticina, Scudder. (Quesnel) 126
Lithortalis picta, Scudder. (Quesnel) 126
Anthomyidæ 126
Anthomyia burgessi, Scudder. (Quesnel) 126
Anthomyia inanimata, Scudder. (Quesnel) 126
HEMIPTERA 126
Gerridæ 126
Gerris stali, Scudder. (Similkameen) 126
Gerris defuncta, Handlirsch. (Quilchena) 126
Pentatomidæ 127
Teleoschistus antiquus, Scudder. (Quesnel) 127
HOMOPTERA 128
Fulgoridæ 128
(?Ricania) antiquata, Scudder. (Similkameen) 128
(??Enchophora) sp., Scudder. (Similkameen) 128
Cercopidæ 128
Aphrophora, sp., Scudder. (Similkameen) 128
Cercopis grandescens, Scudder. (Similkameen) 128
Cercopis selwyni, Scudder. (Similkameen) 128
?Cercopites torpescens, Scudder. (Similkameen) 128
?Palecphora, sp., Scudder. (Similkameen) 128
Stenecphora punctulata, Scudder. (Similkameen) 128
Dawsonites veter, Scudder. (Similkameen) 128
Palaphrodes, sp., Scudder. (Similkameen) 128
Stenolocris venosa, Scudder. (Similkameen) 128
Palaeoplysma venosa, Scudder. (Similkameen) 128
Ptysmaphora fletcheri, Scudder. (Similkameen) 128
Aphrophora angusta, Handlirsch. (Tulameen river) 128

PAGE.
Aphidæ.. 129
Sbenaphis quesneli, Scudder. (Quesnel).. 129
Lachmus petrorum, Scudder. (Quesnel).. 129

ILLUSTRATIONS.

Fig. 1. *Promastax archaicus*, Handlirsch.. 97
" 2. *Xylonomus lambei*, Handlirsch.. 99
" 3. (a) *Archiinocellia oligoneura*, Handlirsch: front and hind wings *in situ*.. 101
" 4. (b) *Archiinocellia oligoneura*, Handlirsch: front wing.. 102
" 5. (c) *Archiinocellia oligoneura*, Handlirsch: hind wing.. 102
" 6. *Penthetria angustipennis*, Handlirsch.. 104
" 7. *Penthetria pulla*, Handlirsch.. 105
" 8. *Penthetria brevipes*, Handlirsch.. 106
" 9. (a) *Penthetria pictipennis*, Handlirsch.. 106
" 10. (b) *Penthetria? pictipennis*, Handlirsch.. 107
" 11. (c) *Penthetria? pictipennis*, Handlirsch.. 108
" 12. *Penthetria elatior*, Handlirsch.. 109
" 13. *Penthetria reducta*, Handlirsch.. 109
" 14. *Penthetria falcatula*, Handlirsch.. 110
" 15. *Penthetria fragmentum*, Handlirsch.. 111
" 16. (a) *Penthetria nana*, Handlirsch.. 111
" 17. (b) *Penthetria nana*, Handlirsch.. 112
" 18. *Penthetria separanda*, Handlirsch.. 112
" 19. *Penthetria pulchra*, Handlirsch.. 113
" 20. (a) *Penthetria avunculus*, Handlirsch.. 114
" 21. (b) *Penthetria avunculus*, Handlirsch.. 115
" 22. *Penthetria avus*, Handlirsch.. 116
" 23. *Penthetria lambei*, Handlirsch.. 116
" 24. *Penthetria ovalis*, Handlirsch.. 117
" 25. *Penthetria transitoria*, Handlirsch.. 118
" 26. *Penthetria canadensis*, Handlirsch.. 119
" 27. *Penthetria curtula*, Handlirsch.. 119
" 28. *Penthetria dilatata*, Handlirsch.. 120
" 29. *Penthetria platyptera*, Handlirsch.. 121
" 30. *Etoptychoptera tertiaria*, Handlirsch.. 122
" 31. *Tipula tulameena*, Handlirsch.. 123
" 32. (a) *Microphorus defunctus*, Handlirsch.. 125
" 33. (b) *Microphorus defunctus*, Handlirsch.. 125
" 34. (a) *Gerris defuncta*, Handlirsch.. 126
" 35. (b) *Gerris defuncta*, Handlirsch.. 127
" 36. *Aphrophora angusta*, Handlirsch.. 128

GEOLOGICAL SURVEY, CANADA.

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VOLUME II.

CANADIAN FOSSIL INSECTS

By Anton Handlirsch.

5. *Insects from the Tertiary Lake Deposits of the southern interior of British Columbia, collected by Mr. Lawrence M. Lambe, in 1906.*[1]

In the year 1906, during geological explorations in the southern interior of British Columbia, Mr. Lawrence M. Lambe, of the Geological Survey, collected a number of remains of Tertiary insects, which were entrusted to me for investigation by Dr. A. P. Low, then Director of the Geological Survey. In presenting the result of my study of these specimens—which have proved to be of unusual scientific interest—I have, at the same time, to express my appreciation of the confidence implied by the placing of this work in my hands.

The entire collection comprises 73 examples: chiefly represented by obverse and reverse impressions; these forms being distributed among the systematic groups as follows:—

Orthoptera (Acridioidea), 1; *Coleoptera*, 4; *Hymenoptera*: Ichneumonidæ, 1; Rhaphidioidea, 1; *Diptera:* Bibionidæ, 54; Ptychopteridæ, 1; Tipulidæ, 2; Empidæ, 1; *Hemiptera*: Pentatomidæ, 1; Gerridæ, 1; *Homoptera*: Cercopidæ, 3; *Insecta incertæ sedis*, 6.

The number of species determined in these groups is: 1, 4, 1, 1, 20, 1, 2, 1, 1, 1, 2, 6, respectively. It is thus seen that in the majority of species only one example of each is present, which is always the case in so comparatively small a collection of fossil insects. Regarding the preservation of this material, it is to be noted that, in relatively many examples the body and extremities are still in association; hence it may be concluded that the insects were entombed at the spot where they met death, and that no transportation by water took place. It is likewise noteworthy that with the exception of one species of Gerris—which is not here considered as a water-strider—all the specimens pertain to species furnished with wings;

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[1] Translated by Miss Lucy P. Bush, of New Haven, Connecticut, U.S.A.

that no apterous larval form of any kind is present, and not a single species living under the water. The question, therefore, is probably, whether the deposits from which the insects come were laid down tolerably far from shore, rather than whether they represent distinctly littoral sediments.

Including the Tertiary insects previously made known from British Columbia—which for the sake of completeness are inserted in my list—the species may be systematically divided in the following manner:—

Orthoptera: Acridioidea. ? Mastacinæ, 1.

Coleoptera: Carabidæ, 1; Elateridæ, 5; Buprestidæ, 3; Hydrophilidæ, 1; Nitidulidæ, 1; Tenebrionidæ, 1; Chrysomelidæ, 3; Scarabæidæ, 1. (Coleoptera incertæ sedis, 3.)

Hymenoptera: Ichneumonidæ.—Pimplinæ, 4; Braconidæ, 2; Formicidæ, 3.

? *Odonata*: ? Libellulidæ, 1.

Raphidioidea: 1.

Neuroptera: Hemerobiidæ, 1.

Diptera: *Orthorrhapha nematocera.*—Mycetophilidæ, 5; Bibionidæ, about 35; Ptychopteridæ, 1; Chironomidæ (several); Tipulidæ, 2. *Orthorrhapha brachycera.*—Asilidæ, 1; Empidæ 1; Dolichopodidæ, 1. *Cyclorrhapha.*—Borboridæ (=Acalyptrate Muscidæ), 5; Anthomyinæ, 2.

Hemiptera: Gerridæ, 2; Pentatomidæ, 2.

Homoptera: Fulgoridæ, 1 (? 2); Cercopidæ, 12; Aphididæ, 2 (incertæ sedis, 1).

Insecta incertæ sedis, 7.

It must necessarily prove difficult to judge of the age of given deposits containing insect material, which comprises scarcely one hundred species: many of which, at best, are inaccurately determined, and are in need of critical revision. However, some definite clues have already been obtained. Thus, it has been rendered conspicuous that hitherto no representatives of the latest and most highly specialized groups of insects have been found. The aphids, muscids *sensu strictu*, syrphids, rhynchophores, cecidomyids, lepidopters, physopods, termites, forficulids, tarsids, chalcidids, etc., are either absent or are only very feebly represented: as the lamellicorns, formicids, etc. All these groups have doubtless persisted since the

Cretaceous; nevertheless in the early Tertiary they did not for a long time attain that pre-eminence for which they were noted in the late Tertiary, the Quaternary, and especially in recent times, where they are distinctly dominant forms. In the early Tertiary they were certainly also well represented in British Columbia; and if they are lacking in the collections, this fact must in part be attributed to accident, and in part to their still meagre numerical development at that time. Moreover, this datum may also be accepted as proof of the relatively high age of the beds in question. A further argument, of perhaps greater significance, rests on the relatively strong representation of groups of Old-world forms: as the elaters, buprestids (which were numerous even in the Lias); the pimplids, belonging to the most primitive apocrite hymenopters; the cercopids, which are also of Jurassic age; also a form of Acrididæ, which does not strictly coincide with any of the recent subgroups; a rhaphidian in which are found characters of both existing genera of this order, and finally, a very primitive phycopterid, the representative of a family existing to-day in a few surviving forms.

The Diptera clearly furnish the most reliable data. Of these forms, the nematocerous Orthorrhapha with encephalous larvæ; also the above-mentioned phycopterid, as well as the chironomids, mycetophilids, and bibionids, have a relatively strong representation, and outnumber all other dipters threefold; while, to-day, these conditions are exactly reversed. The bibionids were especially prominent, and appear to have formed the principal element of the fauna of that time. They are exclusively represented by the genus Penthetria (=Plecia), which throughout the world, at present, includes but few more species than are comprised in the small collection under discussion. We shall, therefore, consider this group more carefully.

Forty-one examples (including those of Scudder) unquestionably belong to the genus Penthetria, while 18 other imperfectly preserved specimens—judging from their structure—may also be included here. The number of species into which these 59 specimens are divided, cannot be regarded as excessive if estimated at about 35; 20 species having been determined from 30 very well-preserved examples. Through the degeneration of one branch of the sector radii, the closely allied genus Bibio is proved to be a form of later derivation, which, however, appears to be entirely wanting. Which of these genera is the older may be inferred from their geological distribution in the European Tertiary; for there occur in the early Tertiary 73 species of Penthetria, with only 23 in the late Tertiary. Bibio, on the other hand, has only 20 species in the early Tertiary, and 29 in the late Tertiary. The latter genus has not been found in the American Tertiary, and with the exception of the form from British Columbia, mentioned by Scudder—which may well be separated into several species—Penthetria has hitherto been represented by only one other early Tertiary species. Only 36 recent species of Penthetria are known, while of Bibio there are 95. The occurrence of so disproportionately large a number of Penthetrias in the Tertiary of British Columbia contemporaneous with the absence of Bibio also indicates that the beds in question belong to the early Tertiary, and are at least Oligocene in age. The supposition is obvious that the genus Bibio originated in the East, probably in Europe, and later found its way to North America, the present geographical distribution of these two genera being about as follows:—

Penthetria: Europe, 1; eastern Asia and Japan, 3; East India and Malay Archipelago, 7; Australia, 5; South Africa, 1; North America, 2; Central America, 8, and South America, 16 species.

Bibio: Europe, 37; eastern Asia, 2; East India, etc., 2; Australia, 6; Africa, 10; North America, 28; Central America, 7, and South America, 8 species.

From these figures it will be seen that Penthetria, to-day, exists principally in tropical and sub-tropical countries; and in temperate zones survives only in individual forms: one of these being the single dwarf European species, *Penthetria holosericea*. Bibio, on the contrary, is especially abundant in the temperate regions of North America and Europe, but is sparingly represented in the south. So much the more interesting, then, is the occurrence of such a large series of fossil Penthetrias—the representatives of existing thermophilous forms—in a latitude so high as is the region of the Similkameen river.

Not only in the Penthetrias, however, but also in Promastax, in the numerous cercopids, and particularly in the huge *Aphrophora angusta* mihi, Ricania,. Scudder, etc., are found proofs of a warm climate at that time.

These data, therefore, taken together, lead to the safe conclusion that the Similkameen deposits are, at least, Oligocene in age.

ORTHOPTERA. Acridioidea.

Promastox archaicus, gen. et. sp. nov. Fig. 1.

Locality: Horsefly mine, British Columbia, (July 20, 1906). L.M.L.)

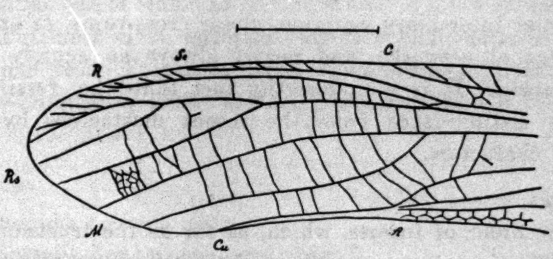

Fig. 1.—*Promastax archaicus*, Handlirsch. (*C*=Costa, *Sc*=Subcosta, *R*=Radius, *Rs*=Sector radii, *M*=Media, *Cu*=Cubitus, *A*=Anal.)

The apical portion of a front wing 18^{mm} long, the entire length of which may have been about 25^{mm}. The breadth is about one-fourth the length. The apical border is rounded off obliquely. The anal area reaches scarcely more than half the length of the wing. The precostal and costal areas are rather broad: the former extending about half the length of the wing. The subcosta lies near the radius, and ends in the last quarter of the length of the wing. The sector radii—which arises somewhat anterior to the middle of the wing—draws toward the upper portion of the apical border; sends off about four small twigs toward the anterior margin, and two straight branches obliquely backward to the apical margin. The media is separated from the radius by a rather broad space, and sends off only one long curved branch to the posterior end of the apical margin. The cubitus is likewise far removed from the media; remains unbranched; makes a short curve toward the end of the anal area, then follows close to the posterior margin almost to the apical border. Between the cubitus and media no intercalary vein is to be seen. Below the cubitus two simple veins are visible, which reach only to the end of the anal area. From the radius to the first anal vein, all interspaces are bridged over by distinct, rather irregularly arranged cross-veins, between which a very delicate irregular network may be made out.

This wing unquestionably belongs to a rather primitive acridioid form. Similar venation is found in existing representatives of the sub-family Acridiinæ, yet here the cubitus is always branched and the anal area is much longer. In its short anal area, this interesting fossil best agrees with the Mastacinæ (s.l.), in which the cubitus also remains unbranched. The existing mastacines, however, exhibit throughout much narrower precostal and costal areas, and a much more regular intercalary venation, closer cross-veins, or only a compact polygonal network; and nearly always an acutely truncated apical margin. It is a noteworthy fact that the fossil form is especially distinguishod from the recent mastacines by its more primitive characters.

COLEOPTERA.

Of this order of insects, which, as far as the trustworthiness of the identifications is concerned, is distinctly a discredit to paleoentomology, a series of forms from British Columbia has been brought to light, the interpretation of which lacks adequate support.

Carabidæ:—

Nebria paleomelas, Scudder. (Nicola river.)

Elateridæ:—

Cryptohypnus ?terrestris, Scudder. (Nicola river.)
Limonius impunctus, Scudder. (Similkameen.)
Elaterites, sp., Scudder. (Similkameen.)
Elateridæ —— Scudder. (Nicola river.)

Among the present fossils is also found an elater from Tulameen river, right branch, 1½ miles above Princeton. (Aug. 7, 1906.—L.M.L.) A more accurate determination seems impossible.

Buprestidæ:—

Buprestis sepulta, Scudder. (Nicola river.)
Buprestis saxigena, Scudder. (Nicola river.)
Buprestis tertiaria, Scudder. (Nicola river.)

Hydrophilidæ:—

Cercyon ? terrigena, Scudder. (Nicola river.)

Nitidulidæ:—

Prometopia depilis, Scudder. (Quesnel.)

Tenebrionidæ:—

Tenebrio primigenius, Scudder. (Ninemile creek.)

Chrysomelidæ:—

Cryptocephalus punctatus, Scudder. (Similkameen.)
Galerucella picea, Scudder. (Ninemile creek.)
Microrhopala, sp., Chagnon. (Vancouver island.)

Scarabæidæ:—

Trox oustaleti, Scudder. (Ninemile creek.)

In the material under consideration, there are three species of coleopters: not one of which have I been able to place in any family. One from Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.); one from Tulameen river, right branch, 1½ miles above Princeton—(August 7, 1906. L.M.L.); and one from Horsefly mine —July 20, 1906. L.M.L.).

HYMENOPTERA.

Ichneumonidæ (*Pimplaria*):—

Xylonomus lambei, sp. nov. Fig. 2.

Locality: Tranquille river—(July 5, 1906. L.M.L.).

A rather incompletely preserved female, which, without the antennæ, but including the distinctly well-marked ovipositor, is 18^{mm} long: and whose front wings exhibit a length of only 10^{mm}. The abdomen is one and one-half times as long as the thorax; measured from its base, the ovipositor is only a little more than two-thirds the length of the abdomen, while its free projecting portion is less than

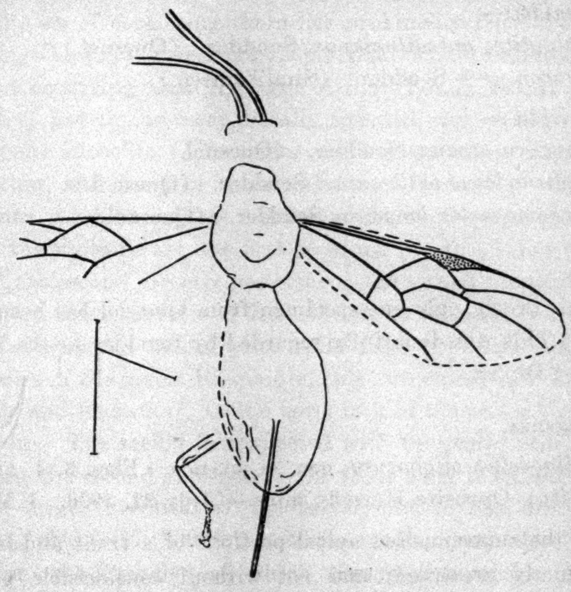

Fig. 2.—*Xylonomus lambei*, Handlirsch.

half the length of the abdomen: the latter joins the thorax with a broad base. The front wings are relatively broad, and only a little shorter than the thorax and abdomen together. The pterostigma is very distinct, and tapers gradually; while the radial cell is subcrescentic in shape, terminating just above the apex of the wing, and is nearly as long as the medial cell. The first discoidal and the first cubital cells fuse in the normal way. The second (small) cubital cell is open toward the third, that is, not shut off by a cross-vein. The second discoidal cell is large, almost twice as broad as it is high, and is separated from the third by a distinctly curved cross-vein. The first of the submedial cells is twice as long as the second, and equals the third in length. The vein which separates the first two is distinctly oblique. The antennæ are relatively robust, but are not preserved in their entirety. Only one of the legs is to be seen: its length indicating a front or middle member.

Scudder cites three Pimplas from British Columbia:—

Pimpla saxea, Scudder. (Quesnel.) Probably a Xylonomus.
Pimpla senecta, Scudder. (Quesnel.)
Pimpla decessa, Scudder. (Quesnel.)

Braconidæ:—

Calyptites antediluvianus, Scudder. (Quesnel.)
Bracon —— Scudder. (Similkameen.)

Formicidæ:—

Formica arcana, Scudder. (Quesnel.)
Dolichoderus obliteratus, Scudder. (Quesnel.)
Aphænogaster longæva, Scudder. (Quesnel.)

ODONATA.

Of this group, only one specimen from Quesnel has been brought to light. This was doubtfully regarded by Scudder as the head of a libellid—? Diplax.

RHAPHIDIOIDEA.

Archiinocellia oligoneura, gen. et sp. nov. Figs. 3, 4, and 5.

Locality: Opposite Horsefly mine—(July 21, 1906. L.M.L.).

Only the superimposed apical portions of a front and hind wing are distinctly preserved: and not without considerable pains was success attained in making out what pertains to each wing. This analysis shows, with great probability, that the fossil indicates a new genus.

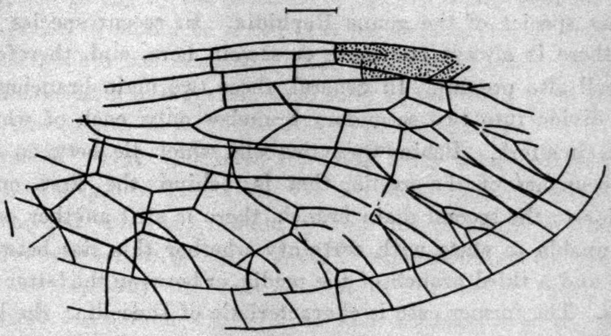

Fig. 3.—*Archiinocellia oligoneura*, Handlirsch. Front and hind wings *in situ.*

This well-preserved specimen is about 7^{mm} long, and permits the assumption that the total length of the wing was from 12 to 14^{mm}. The costal area is not preserved. The pterostigma, together with the apex of the wing, are injured, and it cannot be determined with certainty whether cross-veins were present in the former. In the subcostal area of each wing there lies proximally from the stigma a cross-vein, which, judging from its position, cannot correspond to the cross-vein occurring near the base of the wing in recent species of Rhaphidia; but to the more distally situated cross-vein in the wing of the genus Inocellia. The sector radii arises rather near the base of the wing, and forms a large fork, the branches of which again divide into three branchlets. Between the sector and radius there are only two cross-veins; the first of which lies just below the furcation, and the second directly posterior to the second branching; while in all known recent species of Inocellia three cross-veins are present, the first of which is placed proximally from the large fork. As in most species of the genus Rhaphidia, only two closed cells lie between the radius and its sector. In the large fork of the sector there is also a cross-vein. The media is connected with the sector radii by three cross-veins, the second of which in the front wing is situated distally from the large furcation of the sector, but in the hind wing is anterior to this fork. The trunk of the media terminates in a short bifurcation, the branches of which always dichotomize only once. The second long main branch of the media, which originates just above the origin of the sector radii, is connected with the trunk by only two cross-veins; so that only two closed cells are developed—as in many species of the genus Raphidia. In recent species of Inocellia there is always one more cross-vein here, and, therefore, one more cell also present. In general, these two main branches of the media divide into two secondary branches only, each of which terminates in a fork. Behind these two cells, which lie between the two main branches of the media, that is, behind the first one, and posterior to the second main branch, there is still another cell; but I am unable to state with certainty whether this lies between the second and a third branch of the media, or between the latter and the cubitus. The former case is characteristic of Inocellia; the latter of Raphidia.

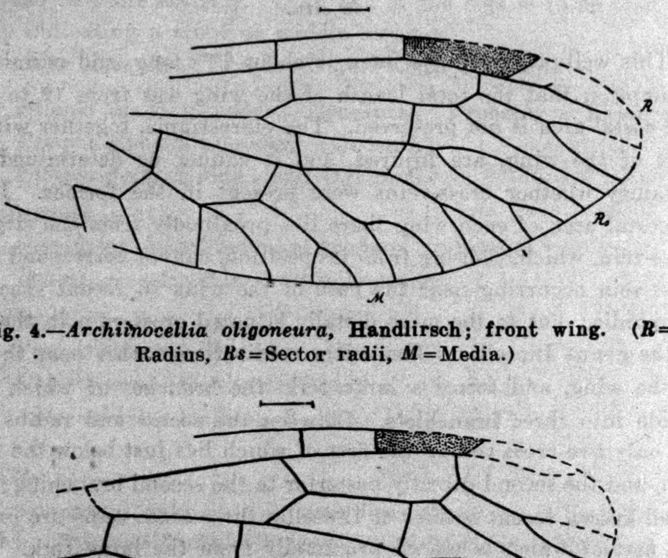

Fig. 4.—*Archiinocellia oligoneura*, **Handlirsch; front wing.** (*R*= Radius, *Rs*=Sector radii, *M*=Media.)

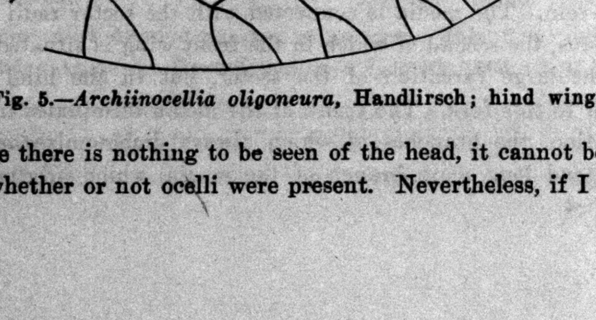

Fig. 5.—*Archiinocellia oligoneura*, **Handlirsch; hind wing.**

Since there is nothing to be seen of the head, it cannot be determined whether or not ocelli were present. Nevertheless, if I were to place this interesting fossil in the genus Inocellia, this course would be suggested chiefly by the presence of the distal subcostal cross-vein. In any event, it should be noted that here characters of both recent raphidian genera are mingled. This fact will probably warrant the establishment of a new genus; especially as the fossil form described by Scudder cannot be admitted in the recent genera.

'*Raphidia*' *erigena*, Hazen, from the lower Oligocene of Europe (amber), is a typical Inocellia. On the other hand, it seems to me that '*Inocellia*' *veterana*, Scudder, from the Miocene of Florissant, represents a distinct genus, which is characterized by the much greater development and ramification of the sector radii, by the much more numerous cross-veins, and consequently by the far greater number of cells; hence, for this genus I propose the name Dictyoraphidia. '*Inocellia*' *tumulata*, Scudder, from Florissant, appears to be most closely allied to the new form above described; but is distinguished by a somewhat more profuse branching of the sector and by three cells between the radius and sector. '*Raphidia*?' *tranquilla*, Scudder, from Florissant, may also be a form most nearly related to *tumulata*; for it distinctly shows the distal cross-vein in the subcostal area, and likewise three cells anterior to the sector.

Regarding '*Inocellia*' *somnolenta*, Scudder, from Florissant, I can express no opinion without having seen the original; for in the drawing the venation of the superimposed wing is not sharply defined. A definite opinion concerning the unfigured '*Inocellia*' *eventa*, Scudder, from Florissant, must likewise be withheld; yet from Scudder's statements relative to its great similarity to *tumulata*, Scudder, one may conclude that it also belongs to the same group as the latter form.

Should these views be confirmed, it will probably become necessary to establish new genera for these complex extinct species, which are intermediate between the two recent genera; hence, for the form above described I propose the name Archiinocellia, and for the others mentioned I suggest the name Archiraphidia.

In addition to the foregoing forms and a larva from the amber, only one other has become known—***Megaraphidia elegans***, Cockerell, from Florissant, which is undoubtedly a well-founded genus. Present knowledge of the fossil raphidians may, therefore, be expressed as follows:—

Megaraphidia elegans, Cockerell.
Dictyoraphidia veterana, Scudder.
Archiinocellia oligoneura, Handlirsch.
Archiraphidia tumulata, Scudder.
?*Archiraphidia tranquilla*, Scudder.
?*Archiraphidia eventa*, Scudder.
Inocellia erigena, Scudder.
?*Inocellia somnolenta*, Scudder.
?*Raphidia* (larva), Menge.

Thus, it may be seen that in organization as well as in number of forms the raphidians were far more fully developed in the Tertiary than at present, which shows that this group has become decidedly retrogressive.

NEUROPTERA.
Hemerobiidæ:—
  Bothromicromus lachlani, Scudder. (Quesnel.)

DIPTERA.
Mycetophilidæ:—
  Sciara deperdita, Scudder. (Quesnel.)
  Boletina sepulta, Scudder. (Quesnel.)
  Brachypeza abita, Scudder. (Quesnel.)
  Brachypeza procera, Scudder. (Quesnel.)
  Trichonta dawsoni, Scudder. (Quesnel.)
Bibionidæ:—
  Penthetria angustipennis sp. nov. Fig. 6.
  Locality: Horsefly mine—(July 20, 1906. L.M.L.).

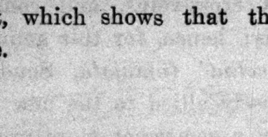

Fig. 6.—*Penthetria angustipennis*, Handlirsch. (*R*=Radius, *Rs*=Sector radii, *M*=Media, *Cu*=Cubitus.

Only one wing is distinctly preserved. This has a length of 8^{mm}, and is three and two-tenths times as long as broad, with a nearly straight costal border. At scarcely more than six-tenths the length of the wing, the radius fuses in the anterior margin in a gentle curve. The sector arises at one-fourth the length of the wing, and in half its own length bifurcates almost exactly below the termination of the radius; the anterior branch is arcuate, and fuses in the anterior margin equidistant from the radius and the posterior branch. The radiomedial cross-vein stands midway between the origin and bifurcation of the sector. The media forks almost exactly in the centre of the wing. The cubitus furcates just below the first fourth of the length of the wing; its posterior branch reaching nearly to the centre, and its anterior member extending two-thirds the length of the wing. The radiomedial cross-vein is situated only a little nearer to the fork of the media than to the mediocubital cross-vein.

Penthetria pulla, sp. nov. Fig. 7.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

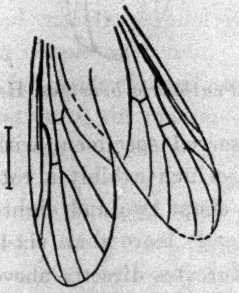

Fig. 7.—*Penthetria pulla,* Handlirsch.

Both wings are well preserved, 8^{mm} long—three times as long as broad—and with a distinctly curved anterior margin. The radius extends seven-tenths the length of the wing, its sector arising at about one-third of the wing's length, and forking just above half its own length directly anterior to the termination of the radius; its anterior branch is slightly arcuate, and fuses immediately below the first third of the distance, between the radius and the posterior branch. The radiomedial cross-vein is situated distinctly nearer to the furcation than to the origin of the sector. The media dichotomizes just below (distally) the middle of the wing, its branches being very much extended and strongly divergent. The cubitus forks at about the first fourth of the length of the wing, its posterior gently curved branch reaching nearly half the length of the wing, and its anterior branch extending about three-fourths the length. The radiomedial cross-vein is more than twice as far removed from the mediocubital cross-vein as from the bifurcation of the media.

Close to the specimen here described lies a second, the wings of which are too indistinct to permit of identification. They correspond in size.

Penthetria brevipes, sp. nov. Fig. 8.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

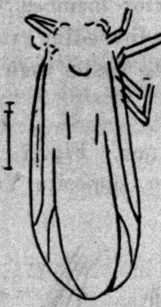

Fig. 8.—*Penthetria brevipes*, Handlirsch.

An imperfectly preserved specimen, with superimposed wings—about 7·5^{mm} in length—which exhibit a rather strongly curved anterior margin, and are about two and eight-tenths times as long as broad. The radius extends more than six-tenths the length of the wing, and its sector bifurcates directly above the termination of the radius; its anterior branch does not approach so near to the radius as in *P. pulla*, and fuses about midway between the radius and the second branch of the sector.

The legs appear to have been very short.

Penthetria pictipennis, sp. nov. Figs. 9, 10, and 11.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

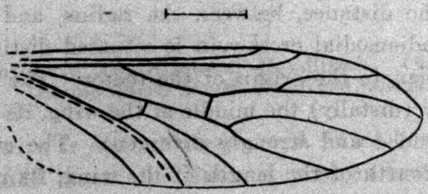

Fig. 9.—*Penthetria pictipennis*, Handlirsch.

A beautifully preserved wing, 12^{mm} in length, three times as long as broad, with opaque borders along the veins. The apex of the wing is sub-acute, the anterior and posterior margins being about equally curved. At about seven-tenths the length of the wing, the radius fuses in the margin in a rather strong curve. The sector originates at about one-fourth the length of the wing and bifurcates at about half its own length, and directly above the termination of the radius. The superior branch presents a nearly sigmoid curve, fusing in the margin midway between the posterior branch and the radius. The radiomedial cross-vein is situated distinctly nearer to the bifurcation than to the origin of the sector. The media divides in the apical half of the wing, its branches being strongly arcuate but not widely divergent. The cubitus draws toward the posterior margin in a relatively steep but gentle curve, its anterior branch fusing somewhat distally from the middle of the wing, while its posterior branch meets the margin at just two-fifths the length of the wing. Close behind the cubitus, and nearly parallel with it, runs a distinct fold, and farther on is a simple anal vein. The mediocubital vein lies more than twice as far above the radiomedial vein as the latter is anterior to the bifurcation of the media.

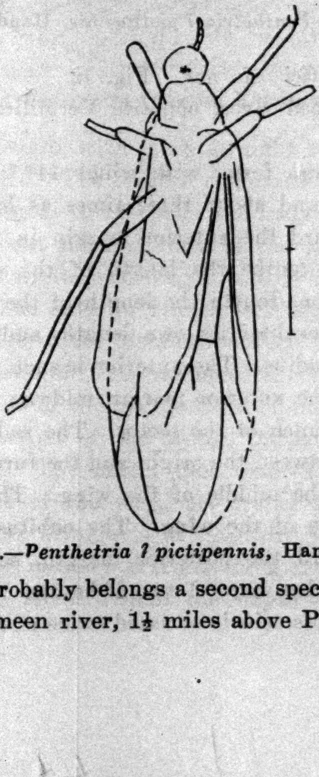

Fig. 10.—*Penthetria ? pictipennis*, Handlirsch.

To this species probably belongs a second specimen from the right branch of the Tulameen river, 1½ miles above Princeton (August 7,

radiomedial cross-vein is more than twice as far removed from the mediocubital cross-vein as from the bifurcation of the media.

Close to the specimen here described lies a second, the wings of which are too indistinct to permit of identification. They correspond in size.

Penthetria brevipes, sp. nov. **Fig.** 8.

***Locality*:** Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

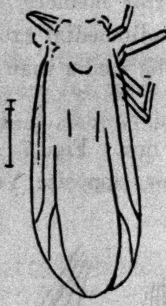

Fig. 8.—*Penthetria brevipes,* Handlirsch.

An imperfectly preserved specimen, with superimposed wings—about 7·5^{mm} in length—which exhibit a rather strongly curved anterior margin, and are about two and eight-tenths times as long as broad. The radius extends more than six-tenths the length of the wing, and its sector bifurcates directly above the termination of the radius; its anterior branch does not approach so near to the radius as in *P. pulla,* and fuses about midway between the radius and the second branch of the sector.

The legs appear to have been very short.

Penthetria pictipennis, sp. nov. Figs. 9, 10, and 11.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

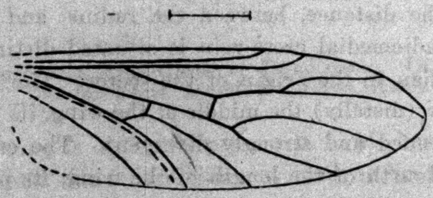

Fig. 9.—*Penthetria pictipennis,* Handlirsch.

A beautifully preserved wing, 12^{mm} in length, three times as long as broad, with opaque borders along the veins. The apex of the wing is sub-acute, the anterior and posterior margins being about equally curved. At about seven-tenths the length of the wing, the radius fuses in the margin in a rather strong curve. The sector originates at about one-fourth the length of the wing and bifurcates at about half its own length, and directly above the termination of the radius. The superior branch presents a nearly sigmoid curve, fusing in the margin midway between the posterior branch and the radius. The radiomedial cross-vein is situated distinctly nearer to the bifurcation than to the origin of the sector. The media divides in the apical half of the wing, its branches being strongly arcuate but not widely divergent. The cubitus draws toward the posterior margin in a relatively steep but gentle curve, its anterior branch fusing somewhat distally from the middle of the wing, while its posterior branch meets the margin at just two-fifths the length of the wing. Close behind the cubitus, and nearly parallel with it, runs a distinct fold, and farther on is a simple anal vein. The mediocubital vein lies more than twice as far above the radiomedial vein as the latter is anterior to the bifurcation of the media.

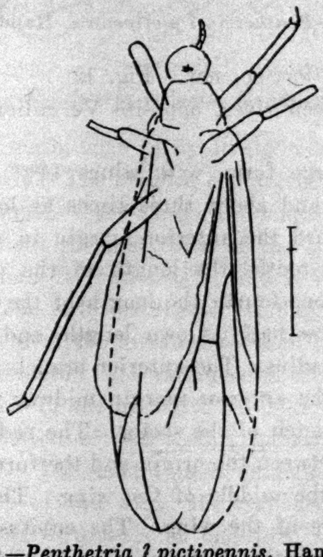

Fig. 10.—*Penthetria ? pictipennis*, Handlirsch.

To this species probably belongs a second specimen from the right branch of the Tulameen river, 1½ miles above Princeton (August 7, 1906). There is also an example from Quilchena (July 31, 1906), in which slight differences in detail may be recognized; but which probably cannot be separated specifically from *P. pictipennis.* Both specimens are quite too imperfectly preserved to admit of exact identification. The form from Quilchena exhibits a stout body greatly overhung by the wings, relatively short robust femora, but in the hind legs very long tibiæ.

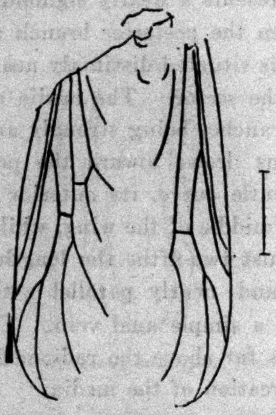

Fig. 11.—*Penthetria ? pictipennis,* Handlirsch.

Penthetria elatior, sp. nov. Fig. 12.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A remarkably large form, with wings 14^{mm} in length, slightly cambered in shape, and about three times as long as broad. The radius proceeds toward the anterior margin in a gentle curve and extends about seven-tenths the length of the wing. The sector originates at about one-fourth the length of the wing, and dichotomizes somewhat below half its own length, and directly above the termination of the radius. The anterior branch is strongly arcuate, long, and fuses in the anterior margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated exactly between the origin and the furcation of the sector, immediately above the middle of the wing. The media bifurcates exactly in the centre of the wing. The cubitus takes a relatively oblique course toward the posterior margin, so that its posterior branch scarcely reaches beyond two-fifths the length of the wing. The mediocubital cross-vein is situated twice as far above the radiomedial cross-vein as the latter is anterior to the branching of the media.

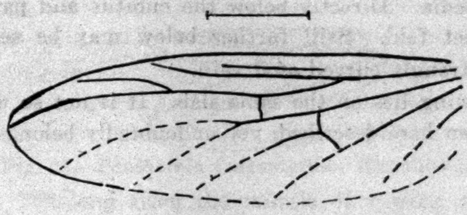

Fig. 12.—*Penthetria elatior*, Handlirsch.

In addition to the wing, there is an abdomen preserved, which is about 9^{mm} in length and from 4 to 5^{mm} in width. There are also a few fragments of legs, indicating that these organs were moderately long and relatively slender.

Penthetria reducta, sp. nov. Fig. 13.
Locality: Horsefly mine—(July 20, 1906. L.M.L.).

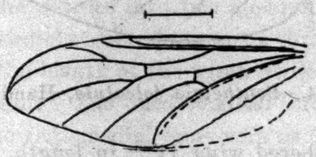

Fig. 13.—*Penthetria reducta*, Handlirsch.

A wing 8·5^{mm} in length, with fairly straight anterior border and arcuate posterior margin. The breadth compared to the length is as 1:2·7. The radius extends seven-tenths the length of the wing; its sector originates at about the first third of the length of the wing, bifurcates at exactly half its own length, and is very markedly sigmoid in curvature. The anterior branch is long, and fuses in the margin at the first third of the distance between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated about at the termination of the middle third of the distance between the origin and bifurcation of the sector, immediately below the middle of the wing. The media dichotomizes quite a distance posterior to the centre of the wing, its branches being distinctly divergent. The cubitus bifurcates at one-third the length of the wing, and its posterior member proceeds in a strong curve to the lower margin, which it meets at half the length of the wing. The mediocubital cross-vein is situated more than three times as far above the radiomedial cross-vein as is the latter anterior to the furcation of the media. Directly below the cubitus and parallel with it runs a distinct fold. Still farther below may be seen the basal portion of a strongly curved anal vein.

A second wing lies on the same slab. It is not so well preserved as the specimen here described, yet undoubtedly belongs to the same individual.

Penthetria falcatula, sp. nov. **Fig. 14.**

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

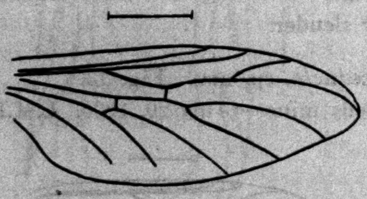

Fig. 14.—*Penthetria falcatula,* Handlirsch.

A distinctly cambered wing 11^{mm} in length, the breadth and the length being in the proportion of 1:2·6. The radius stretches seventenths the length of the wing, and is but slightly curved; its sector springs off anterior to the first third of the length of the wing, bifurcates at half its own length, and is distinctly arcuate. Its anterior branch is moderately long, curved, and fuses in the margin directly below the first third of the space between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated midway between the origin and bifurcation of the sector, and immediately above the centre of the wing. The media dichotomizes a short distance below the middle of the wing, and forms two widely diverging branches. The cubitus forks at one-third the length of the wing, and its posterior branch proceeds in a broad curve toward the lower margin, where it fuses somewhat anterior to half the length of the wing. A distinctly curved anal vein is present. The mediocubital cross-vein is twice as far from the radiomedial cross-vein as is the latter from the furcation of the media.

Penthetria fragmentum, sp. nov. Fig. 15.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

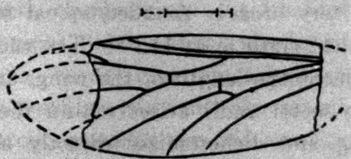

Fig. 15.—*Penthetria fragmentum,* Handlirsch.

A portion 7^mm^ long from the middle of a wing about 11^mm^ in length, the form of which was apparently rather elliptical; its breadth and length were about in the proportion of 1:2·8. The radius is nearly straight, and appears to extend somewhat beyond seven-tenths the length of the wing. The sector arises immediately posterior to the first third of the length of the wing and is distinctly arcuate. The radiomedial cross-vein is situated about the middle of the length of the wing and also midway between the origin and bifurcation of the sector. Quite a distance distally beyond the centre of the wing, the media divides into two apparently widely divergent branches. The moderately curved posterior branch of the cubitus reaches beyond half the length of the wing, while the anterior branch is remarkably straight. The mediocubital cross-vein is situated twice as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media. The first anal vein is nearly parallel with the cubitus.

Penthetria nana, sp. nov. Figs. 16 and 17.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

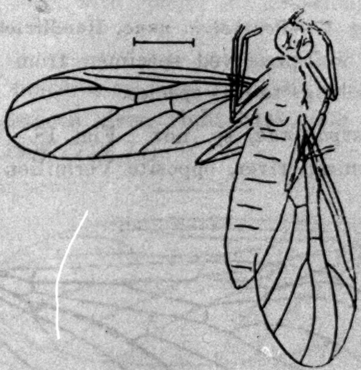

Fig. 16.—*Penthetria nana,* Handlirsch.

An insect 8^{mm} in length, with rather long, slender legs and a relatively large head. The length of the wing is 8^{mm}; its form is subelliptical, with very broadly rounded apical margin. The ratio of the breadth to the length is as 1:2·8. The radius extends rather more than seven-tenths the length of the wing, and terminates in a gentle curve. The sector radii arises within the first third of the length of the wing and dichotomizes directly above half its own length. Its anterior branch is relatively short, strongly curved, very widely divergent, and fuses in the margin at one-third the distance between the radius and the second branch of the sector. The media branches distally below the middle of the wing into two widely divergent members. The cubitus is much curved at the beginning, but its two branches slope without marked curvature to the posterior margin. The mediocubital cross-vein is situated one and one-half times as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media.

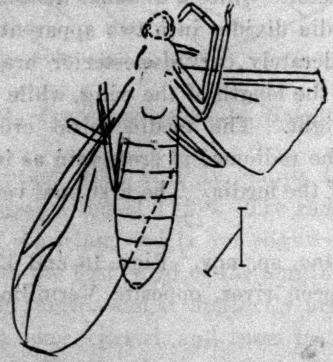

Fig. 17.—*Penthetria nana,* Handlirsch.

A second, less well-preserved specimen from the same locality undoubtedly also belongs to this species.

Penthetria separanda, sp. nov. Fig. 18.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

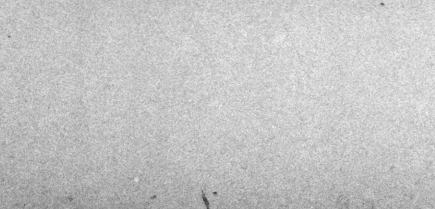

Fig. 18.—*Penthetria separanda,* Handlirsch.

A wing 12^{mm} in length, whose breadth to the length is in the proportion of 1:2·7. The greatest width is somewhat distal to the middle of the length of the wing. At its beginning the anterior margin runs off straight, but bends sharply downward in the terminal third. The posterior border is symmetrically curved. The radius extends slightly beyond seven-tenths the length of the wing, and terminates in a strong retroflex forward curve. The sector springs forth close to the first third of the length of the wing, and is distinctly arcuate. Its bifurcation takes place at half its own length, and the strongly curved anterior branch follows in the same direction as the posterior branch, reaching the anterior border exactly midway between the radius and the posterior branch. The radiomedial cross-vein is situated somewhat nearer to the furcation than to the origin of the sector, and just distal to the middle of the wing. The media divides quite a distance below the middle of the wing; its anterior branch is symmetrically curved, and at the end converges toward the nearly straight posterior branch. The trunk of the cubitus and its posterior branch proceed in a gentle uniform curve toward the posterior margin, which they meet at half the length of the wing. The anterior branch is slightly curved. The mediocubital cross-vein is situated not quite twice as far above the radiomedial cross-vein as is the latter anterior to the bifurcation of the media. The fold follows close to the cubitus. The first anal vein is slightly divergent, and at its base the remnant of a second anal vein may be seen.

This wing is especially well preserved, the base, with the typical cross-veins between the costa, radius, and media being distinctly visible. An anal lobe, with opaque borders along the veins, is also to be seen.

Penthetria pulchra, sp. nov. Fig. 19.

Locality: Tulameen river, right bank, one mile above Princeton—(August 7, 1906. L.M.L.).

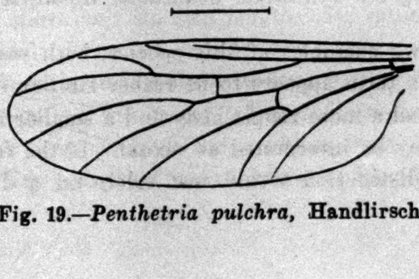

Fig. 19.—*Penthetria pulchra*, Handlirsch.

This wing is 13^{mm} in length. The ratio of the breadth to the length is as 1:2·7. In form, it departs slightly from *P. separanda*, since the greatest width lies in the middle of the wing, the anterior margin is not so strongly curved downward, and the basal portion is not so much reduced. The radius extends scarcely seven-tenths the length of the wing, and at the end shows only a very slight curvature. The sector arises just above the first third of the length of the wing and is very gently curved, bifurcating somewhat beyond half its own length; its anterior branch is strongly arcuate, rather long, and fuses in the margin rather nearer to the posterior branch than to the end of the radius. The radiomedial cross-vein lies nearer to the forking than to the origin of the sector, and exactly in the middle of the wing. A little below the middle of the wing, the media separates into two distinctly curved divergent branches. The cubitus with its two branches, which curve strongly downward, does not reach quite half the length of the wing. The mediocubital cross-vein is situated rather more than twice as far above the radiomedial cross-vein as the latter is above the forking of the media. The simple anal vein is slightly less curved than the cubitus. The wing appears to have been very opaque in the costal region.

Penthetria avunculus, sp. nov. Figs. 20 and 21.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

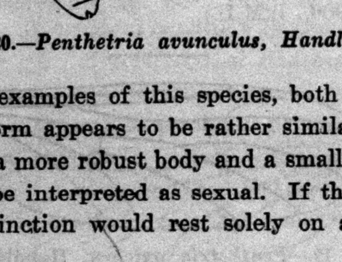

Fig. 20.—*Penthetria avunculus, Handlirsch.*

There are two examples of this species, both rather imperfectly preserved. This form appears to be rather similar to *P. nana*; but seems to have had a more robust body and a smaller head, differences that perhaps may be interpreted as sexual. If the forms were to be separated, the distinction would rest solely on a difference in the neuration of the wings. The latter are $8{\cdot}5^{\mathrm{mm}}$ long, broadly rounded at the apex, and somewhat narrower in the basal than in the apical portion. The breadth is to the length as 1:2·6. In the apical half of the wing, the anterior margin curves strongly downward. The radius runs out nearly straight, and extends scarcely seven-tenths the length of the wing. The sector arises immediately above the first third of the length of the wing, and at about half its own length divides into two branches, the anterior of which bends upward in a nearly sigmoid curve, while the posterior is broadly arcuate, so that both branches are strongly divergent, and take quite different directions.

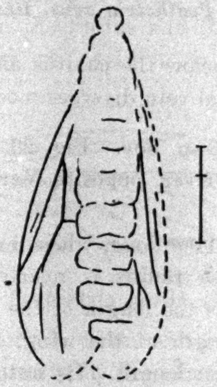

Fig. 21.—*Penthetria avunculus*, Handlirsch.

Penthetria avus, sp. nov. Fig. 22.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This wing is 10^{mm} long, the breadth to the length being about as 1:2·6. The anterior margin is strongly curved, the apex not broadly rounded. Toward the end the radius is slightly bent, and reaches seven-tenths the length of the wing; its sector issues just below the first quarter of the length of the wing, is distinctly sigmoid, and forks quite a distance above half its own length. Its rather long anterior branch is not widely divergent, and follows a course similar to that of the posterior branch, fusing about midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is about twice as far removed from the origin as from the furcation of the sector, and lies somewhat above half the length of the wing.

Somewhat distally below the middle of the wing, the media furcates into two slightly divergent branches. The posterior branch of the cubitus passes to the lower margin in a steep curve, not reaching the centre. The mediocubital cross-vein is situated two and a half times as far above the radiomedial cross-vein as is the latter above the fork of the media. Directly below the cubitus and parallel with it runs a fold. The first simple anal vein diverges moderately from the cubitus.

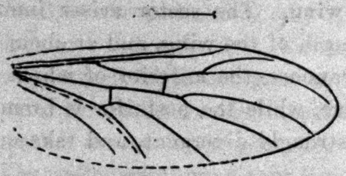

Fig. 22.—*Penthetria avus*, Handlirsch.

Penthetria lambei, sp. nov. Fig. 23.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A subelliptical wing 11^{mm} long, whose breadth is to its length in the ratio of 1:2·5. The radius is nearly straight, and stretches quite beyond seven-tenths the length of the wing. Its sector springs off at one-fourth the length of the wing, is strongly sigmoid, and bifurcates in half its own length. Its anterior branch is distinctly curved, and fuses in the margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is farther removed from the origin than from the fork of the sector, and lies almost precisely in the middle of the wing. Just below half the length of the wing, the media separates into two moderately divergent branches. The cubitus with its posterior branch forms a gentle curve, and strikes the posterior margin at half its length. The mediocubital vein lies three times as far above the radiomedial cross-vein

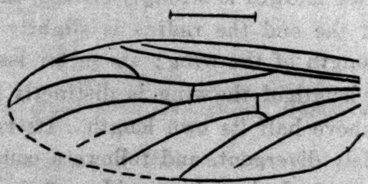

Fig. 23.—*Penthetria lambei*, Handlirsch.

as does the latter above the forking of the media. The first anal vein runs nearly parallel with the cubitus.

Penthetria ovalis, sp. nov. Fig. 24.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A subelliptical wing 10^{mm} long, the breadth and length of which are in the proportion of 1:2·4. The radius takes a nearly straight course, and reaches seven-tenths the length of the wing. Its sector originates at one-fourth the length of the wing, and is very gently arcuate. It dichotomizes in half its own length, and the anterior branch makes a strong curve, is widely divergent, and fuses in the margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein is situated much nearer to the bifurcation than to the origin of the sector and is directly above the middle of the wing. Exactly in the centre of the wing the media separates into two long moderately divergent branches. The posterior branch of the cubitus is very much curved, and strikes the posterior border in the centre. The mediocubital cross-vein is more than three times as far removed from the radiomedial cross-vein as is the latter from the forking of the media. Immediately below the cubitus and parallel with it runs a fold, and farther below a divergent anal vein is clearly seen. The entire wing appears to have been uniformly opaque.

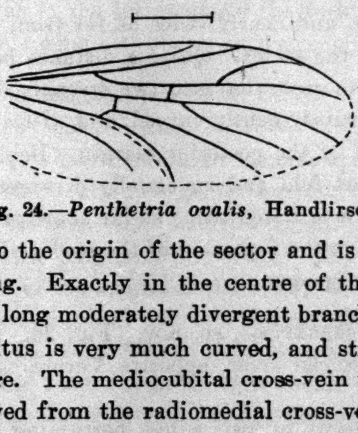

Fig. 24.—*Penthetria ovalis*, Handlirsch.

Penthetria transitoria, sp. nov. Fig. 25.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This specimen exhibits an entire insect, the body of which is very much crushed, yet it is possible to make out that the thorax and abdomen were relatively robust, while the legs were slender. The wings are 10^{mm} long, and are well preserved. They show a rather strongly-curved anterior margin, and a still more arched posterior border. Their breadth and length are in the ratio of 1:2·3. The radius is nearly straight, and reaches more than seven-tenths the length of the wing. The sector arises immediately below the first fourth of the length of the wing, is gently arcuate, and just distal to half its own length sends off an oblique indistinct anterior branch toward the end of the radius. The radiomedial cross-vein lies in the centre of the wing, and nearly twice as far from the origin as from the bifurcation of the sector. Quite a distance below the middle of the wing, the media separates into two strongly divergent branches. The cubitus is relatively gently curved, and with its posterior branch reaches the middle of the posterior margin. Behind it may be seen a distinct divergent fold and an equally divergent anal vein. The mediocubital vein is situated twice as far above the radiomedial vein as is the latter above the furcation of the media. In the costal region the wing was very opaque.

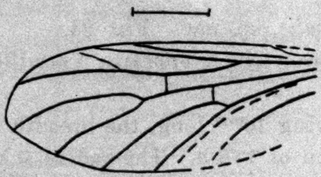

Fig. 25.—*Penthetria transitoria,* **Handlirsch.**

Penthetria canadensis, sp. nov. Fig. 26.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

This form consists of two wings pertaining to one individual. The wings are 10^{mm} long, with slightly arched anterior border, and strongly curved posterior margin. The breadth and the length are in the proportion of 1:2·2. The radius curves gently toward the anterior margin, and extends seven-tenths the length of the wing. Its sector springs forth just below the first fourth of the length of the wing, and separates into two branches directly above half its own length; the anterior of these is strongly and simply curved, is widely divergent, and strikes the margin decidedly nearer to the radius than to the posterior branch. The latter is strongly curved. The radiomedial cross-vein lies somewhat above the centre of the wing, and only half as far from the furcation as from the origin of the sector. Just below the middle of the wing the media divides into two strongly divergent branches. With its posterior branch the cubitus forms a steep downward-trending curve, which strikes the posterior margin above the centre. Immediately behind the cubitus and parallel with it runs a fold; and farther on, but likewise parallel with the cubitus, the anal vein proceeds to the posterior margin. The mediocubital vein is situated fully twice as far above the radiocubital cross-vein as is the latter above the fork of the media. In the costal region this wing also shows very strong pigmentation.

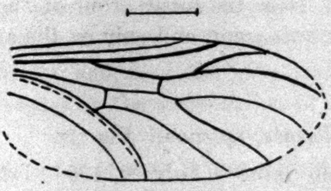

Fig. 26.—*Penthetria canadensis,* Handlirsch.

Penthetria curtula, sp. nov. Fig. 27.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A wing 8^{mm} long, whose breadth and length are in the proportion of 1:2. The anterior margin is gently curved, while the posterior border is strongly arcuate. The nearly straight radius extends not quite seven-tenths the length of the wing. The sector issues just above the first third of the length of the wing; while above its bifurcation—which occurs in half its own length—it forms an obtuse angle, and then a flat curve. The anterior branch is remarkably short, widely divergent, and fuses in the margin nearer to the radius than to the posterior branch. The radiomedial cross-vein is equidistant from the forking and the origin of the sector, and lies somewhat above the middle of the wing. Somewhat below the middle of the wing, the media separates into two moderately divergent branches. The cubitus slopes downward in a fairly steep curve, and with its

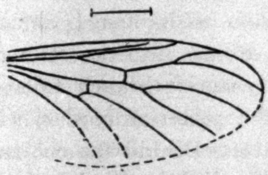

Fig. 27.—*Penthetria curtula,* Handlirsch.

posterior branch strikes the lower margin about in the centre. The first anal vein is strongly divergent. The mediocubital cross-vein is only one and one-half times as far removed from the radiomedial cross-vein as this is from the bifurcation of the media. The wing appears uniformly transparent, and only on the anterior border somewhat opaque.

Penthetria dilatata, sp. nov. Fig. 28.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A remarkably broad wing 10^{mm} long, with slightly curved anterior margin and strongly arcuate posterior border. The breadth to the length is as 1:1·9. The radius, which bends slightly forward at the end, extends beyond seven-tenths the length of the wing. The sector arises just above the end of the first third of the wing's length, and is strongly sigmoid in curvature. It dichotomizes in half its length into widely divergent branches: the anterior of which is gently curved, and fuses in the margin midway between the radius and the posterior branch of the sector. The radiomedial cross-vein lies somewhat farther from the origin than from the furcation of the sector and just above the middle of the wing. Somewhat below the centre of the wing the media divides into two strongly divergent branches. The cubitus with its posterior branch falls off abruptly but in a gentle curve toward the posterior border, which it strikes some distance above the centre. Behind the cubitus runs a parallel fold, and farther on a simple slightly divergent anal vein. The mediocubital vein lies one and one-half times as far above the radiomedial cross-vein as is the latter above the forking of the media. The costal region is densely opaque.

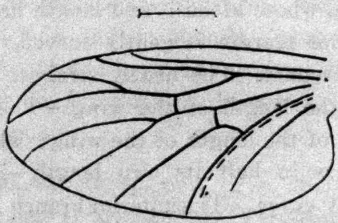

Fig. 28.—*Penthetria dilatata*, Handlirsch.

Penthetria platyptera, sp. nov. Fig. 29.

Locality: Horsefly mine—(July 20, 1906. L.M.L.).

A large very heavily built insect, with broad wings of subelliptical form, slightly curved anterior margin, and strongly arched posterior border, and with broadly rounded off apex. The radius extends seven-tenths the length of the wing and is only very gently curved. Its sector issues at the termination of the first third of the length of the wing, is very gently arcuate, and bifurcates in half its own length. The anterior branch is not widely divergent, although it is strongly curved and relatively long, and fuses in the margin equidistant from the radius and the posterior branch. The radiomedial cross-vein is situated some distance below the centre of the wing and three times as far from the base as from the fork of the sector. The media forms a relatively short but widely divergent bifurcation. The cubitus is very strongly curved, but fuses in the posterior margin just below the middle. The anal vein dichotomizes in half its own length. The mediocubital cross-vein is somewhat more than twice as far removed from the radiomedial cross-vein as is the latter from the furcation of the media. The entire wing is strongly pigmented, and is especially opaque toward the anterior margin.

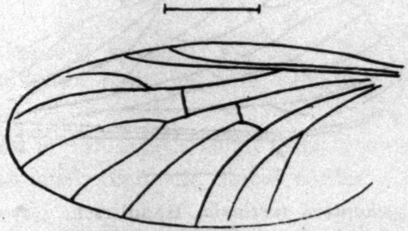

Fig. 29.—*Penthetria platyptera,* Handlirsch.

In addition to the foregoing species, which comprise 24 examples in all, there are 12 other specimens in the collection that undoubtedly belong in the genus Penthetria, yet are too imperfectly preserved to render the species sufficiently characteristic for identification. Eighteen other examples are certainly bibionids, and it is highly probable that all belong to the genus Penthetria, so that of the whole number of 73 insects, 54 may pertain to this bibionid genus. Only one form belonging to this family was hitherto known from this region, namely, *Penthetria similkameena,* Scudder, from the Similkameen river. It is thought, however, from what is revealed by the description and illustration, that several species are included under this name.

Ptychoptevid :—

Etoptychoptera tertiaria, gen. et sp. nov. Fig. 30.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A portion of a wing 12^{mm} long, the entire length of which may have been about 14^{mm}. The anterior border is nearly straight, while the apical and posterior margins are distinctly rounded. The costa, subcosta, and radius lie very close to each other and are nearly parallel. The subcosta extends almost two-thirds the length of the wing and fuses in the costa. The radius continues nearly to the apex of the wing and fuses unbranched in the apical margin. Its sector originates quite near the base of the wing, and at one-third the length of the wing it separates into two widely divergent trunks, the anterior of which forms a long terminal fork, while the posterior branch divides into two short twigs, so that four branchlets are present. The media takes its course nearly through the centre of the wing, and at one-third the wing's length it furcates into two main branches, the anterior of which is slightly arcuate and is parallel with the posterior branch of the sector; it fuses at the end of the posterior margin, and, if I mistake not, forms a short terminal fork. The posterior branch of the media, however, isues obliquely toward the anterior branch of the cubitus, with which it unites nearly at right angles; after a short common course these again separate, the posterior branch of the media curving toward the posterior margin and forming a short bifurcation, while the anterior

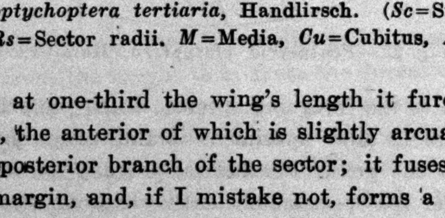

Fig. 30.—*Etoptychoptera tertiaria*, Handlirsch. (*Sc*=Subcosta, *R*=Radius, *Rs*=Sector radii. *M*=Media, *Cu*=Cubitus, *A*=Anal.)

branch of the cubitus proceeds in its original direction. The posterior branch of the cubitus bends at an obtuse angle above the furcation, and fuses close to the first anal vein, which is gently curved. The second anal vein is slightly sigmoid in curvature. To all appearance this wing was transparent, the veins having opaque borders.

This fossil is of the greatest interest, since it departs essentially from all known recent and extinct ptychopterids, and exhibits very primitive characters. Thus, the radius with its sector is especially conspicuous, being still at the same stage as is found in the Liassic eoptychopterid *Eolimnobia geinitzi,* Handlirsch. Notwithstanding its transient fusion, the media, also, is much more primitive than in the recent genera Ptychoptera and Bittacomorpha; yet not more so than in *Macrochile spectrum,* Löw, from the amber, or in the recent but also very ancient forms, Tanyderus and Protoplasa. The media agrees best with the Liassic *Proptychoptera liasina,* Handlirsch. The development of the two anal veins is likewise very primitive.

Chironomidæ:—

In the year 1877, Scudder mentioned some chironomids from Quesnel without describing them.

Tipulidæ:—

Tipula tulameena, sp. nov. Fig. 31.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A wing at least 9^{mm} in length, about three times as long as broad, with a rather obliquely truncate apical border. The sector radii arises about the middle of the length of the wing, and forms two normal branches. The media bifurcates in the usual way: its anterior branch is divided, and above the forking it unites with the

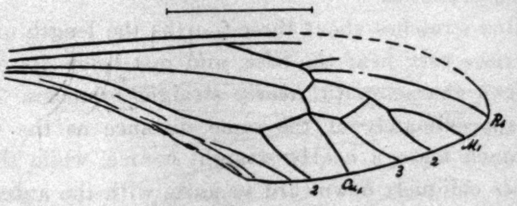

Fig. 31.—*Tipula tulameena,* **Handlirsch. (Rs=Sector radii, M 1, 2, 3= Media, Cu 1, 2=Cubitus.)**

simple posterior branch by means of an oblique cross-vein, so that the typical irregularly pentagonal cell results. With its anterior branch—which is bent almost at right angles—the long, nearly sigmoid cubitus comes in contact with the posterior branch of the media, and with its own posterior branch extends close to the first anal vein. The normal opaque spot in the radial region is very large, and other more opaque places appear to have been present in the medial and cubital regions.

Of the species of Tipula from Florissant made known by Scudder, *T. maclurei* and *T. tartari* approach the nearest to similar marking; yet the correspondence is not so close that an identification could be attempted.

In addition to the foregoing species, there is in the collection an indeterminable tipulid from Tulameen river.

Asilidæ:—

In 1879, a form belonging to this family was cited by Scudder from British Columbia, but was not characterized.

Empidæ:—

Microphorus defunctus, sp. nov. Figs. 32 and 33.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

A very small form, the body of which is scarcely more than 4^{mm} in length, with wings 4^{mm} long, the breadth and length being in the proportion of 1 : 2·3. The neuration can be made out only with great difficulty, but with the exception of the cubitus, which is not yet so strongly reduced, it appears to be rather similar to that of recent species of Microphorus.

The radius stretches about three-fourths the length of the wing; its sector arises very near the base, and just below its origin separates into two characteristic nearly straight branches. The media bifurcates approximately at the same distance as the sector; its anterior branch takes a nearly straight course, while the posterior branch slopes obliquely downward to unite with the anterior branch of the cubitus, then separating from the latter it proceeds obliquely toward the anterior branch of the media, with which it is connected by a cross-vein, finally bending at an obtuse angle toward the apical border. Thus is formed the characteristic medial cell, which extends two-fifths the length of the wing, is irregularly pentagonal, and whose length is more than three times its height. The trunk of the cubitus reaches not quite a third the length of the wing; its branches diverge in opposite directions, so that they form an angle of 180° with the trunk. The posterior branch slopes obliquely backward toward the base of the wing, is somewhat shorter than the free portion of the anterior branch, and strikes the nearly straight anal vein about in the middle.

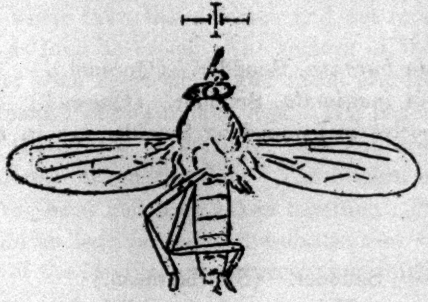

Fig. 32.—*Microphorus defunctus*, Handlirsch.

The abdomen is much narrower than the robust, highly arched thorax, and at most is half as long again as the latter. The head is short and broad, but is not easily made out. Two legs are preserved (? hind legs). Their femora are normal, have a little more than two-thirds the length of the wing, and are only slightly longer than the somewhat terminally expanded tibiæ. The tarsi also appear to have been somewhat expanded.

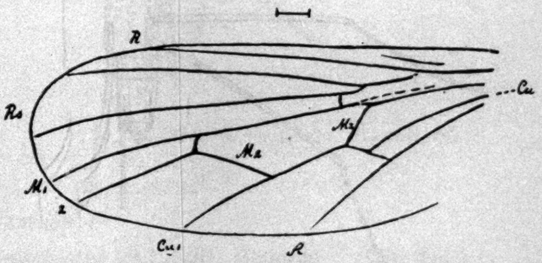

Fig. 33.—*Microphorus defunctus*, Handlirsch. (*R*=Radius, *Rs*=Sector radii, *M 1, 2*=Media, *Cu*=Cubitus, *A*=Anal.)

Dolichopodidæ:—
Dolichopus? sp., Scudder. (Quesnel.)

Borboridæ:—
Heteromyza senilis, Scudder. (Quesnel.)
Sciomyza revelata, Scudder. (Quesnel.)
Lonchaea senescens, Scudder. (Quesnel.)
Palloptera morticina, Scudder. (Quesnel.)
Lithortalis picta, Scudder. (Quesnel.)

Anthomyidæ:—
Anthomyia burgessi, Scudder. (Quesnel.)
Anthomyia inanimata, Scudder. (Quesnel.)

All these species mentioned by Scudder are in need of critical revision.

HEMIPTERA.

Gerridæ:—
Gerris ståli, Scudder. (Similkameen.)
The genus Telmatrechus established by Scudder on this species is not well founded.
Gerris defuncta sp. nov. Figs. 34 and 35.
Locality: Quilchena—(July 31, 1906. L.M.L.).

An entire insect without wings, which doubtless represents an apterous form, the body, including the head, measuring 15^{mm} in

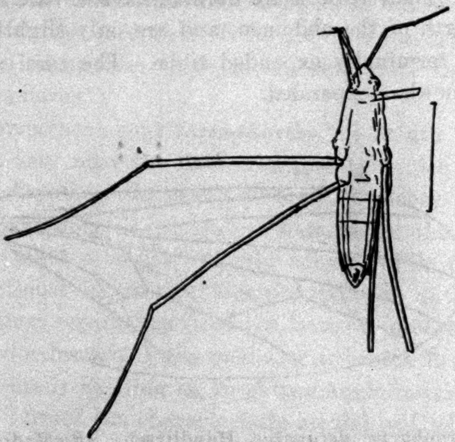

Fig. 34.—*Gerris defuncta*, Handlirsch.

length. The head is almost equilaterally triangular, with very slightly bulging eyes. The first and third joints of the antennæ are nearly equal in length, and singly are about a third longer than the second. The first is much longer than the head. The head and thorax taken together are somewhat longer than the abdomen, the thorax alone being somewhat shorter. The abdomen is nearly two and one-half times as long as it is broad at the base, and exhibits the slightly projecting corners of the preanal (7th) segment. The thorax is only a little wider than the abdomen and not more than one and one-half times as long as broad. The femora of the front legs are somewhat longer than their tibiæ, and reach scarcely one-third the length of the femora of the middle legs. The latter joints are distinctly shorter than those of the hind legs, and are as long as the thorax and abdomen taken together. The femora of the hind legs are as long as the head and body taken together. The length of the tibiæ of the middle legs is about five-sixths that of their femora, while the tibiæ of the hind legs are scarcely two-thirds as long as the femora.

These dimensions sufficiently characterize the species, and prove it to be distinct from *G. stali.*

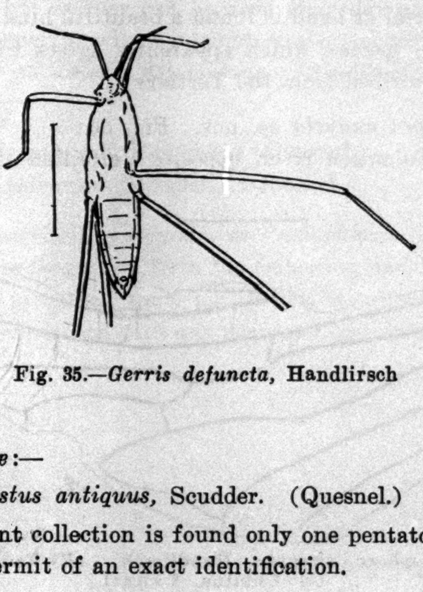

Fig. 35.—*Gerris defuncta,* Handlirsch

Pentatomidæ:—

Teleoschistus antiquus, Scudder. (Quesnel.)

In the present collection is found only one pentatomid form, and this does not permit of an exact identification.

HOMOPTERA.

Fulgoridæ:—

(*?Ricania antiquata*, Scudder. (Similkameen.)

(*??Enchophora*) sp., Scudder. (Similkameen.)

The latter fossil is of a most doubtful nature.

Cercopidæ:—

The following have been previously recorded from this region:—

Aphrophora, sp., Scudder. (Similkameen.)
Cercopis grandescens, Scudder. (Similkameen.)
Cercopis selwyni, Scudder. (Ninemile creek.)
?Cercopites torpescens, Scudder. (Similkameen.)
?Palecphora, sp., Scudder. (Similkameen.)
Stenolocris venosa, Scudder. (Similkameen.)
Stenecphora punctulata, Scudder. (Similkameen.)
Dawsonites veter, Scudder. (Similkameen.)
Palaphrodes sp., Scudder. (Similkameen.)
Palaphrodes, sp. Scudder. (Similkameen.)
Palæoptysma venosa, Scudder. (Similkameen.)
Ptysmaphora fletcheri, Scudder. (Similkameen.)

All these species need a thorough revision

In the material at hand is found a beautiful hind wing belonging to a very large species, which apparently agrees with none of the many forms described from the Tertiary:—

Aphrophora angusta sp. nov. Fig. 36.

Locality: Tulameen river, opposite Vermilion cliff—(August 6, 1906. L.M.L.).

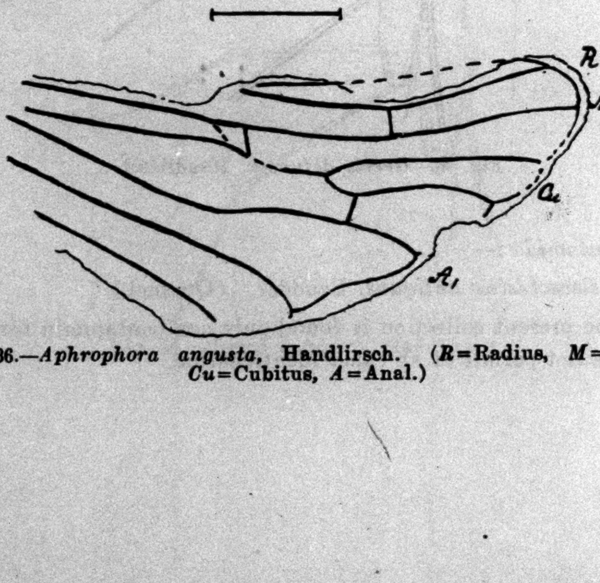

Fig. 36.—*Aphrophora angusta*, Handlirsch. (*R*=Radius, *M*=Media, *Cu*=Cubitus, *A*=Anal.)

The portion preserved measures 17^{mm} in length, and permits the assumption that the total length of the wing may have been more than 20^{mm}.

The radius and media are nearly parallel with each other, and at the first third of the wing are united by a cross-vein. The cubitus is distinctly curved, and in about the middle of the wing is joined to the media by a sloping cross-vein. At half the distance between the latter and the radiomedial cross-vein, the cubitus bifurcates into a large fork, which encloses a somewhat biscuit-shaped cell. The posterior branch of the cubitus is connected with the first anal vein by a cross-vein, the former being very strongly arcuate, while the two succeeding anal veins are straight. Here and there the marginal vein is well preserved, and from the radius to the first anal vein, especially between the two long veins, it forms a simple curve, while between the first and second anal veins, the curve is sigmoid.

There is no doubt that this species belongs in the genus Aphrophora in the strict sense, yet to-day this genus includes only numerous small forms.

An indistinct impression of a front wing (without anal area), likewise 17^{mm} in length, from Tranquille river, may also be referred to the cercopids; as well as a small fragment of a wing from the Horsefly mine, but neither can be accurately determined.

To the auchenorrhynchous homopters also belongs a form identified by Scudder as *Cœlidia columbiana.* (Similkameen.)

Aphididæ:—
  Sbenaphis quesneli, Scudder. (Quesnel.)
  Lachnus petrorum, Scudder. (Quesnel.)

One wing described by Scudder as *Planophlebia gigantea* (Similkameen), and six fragments from the collection under discussion are so imperfectly preserved that, not even the order in which they belong can be determined with any degree of certainty.

CANADA

DEPARTMENT OF MINES

GEOLOGICAL SURVEY BRANCH

Hon. W. Templeman, Minister; A. P. Low, Deputy Minister;
R. W. Brock, Director.

SELECTED LIST OF REPORTS AND MAPS
(SINCE 1885)
OF SPECIAL ECONOMIC INTEREST

PUBLISHED BY

THE GEOLOGICAL SURVEY.

Reports of the Mines Section:—

No. 245.	Report of Mines Section,	1886.	No. 662.	Report of Mines Section,	1897.
272	“ “	1887.	698	“ “	1898.
*300	“ “	1888.	718	“ “	1899.
301	“ “	1889.	744	“ “	1900.
334	“ “	1890.	800	“ “	1901.
335	“ “	1891.	835	“ “	1902.
360	“ “	1892.	893	“ “	1903.
572	“ “	1893-4.	928	“ “	1904.
602	“ “	1895.	971	“ “	1905.
625	“ “	1896.			

Mineral Production of Canada:—

No. *414.	Year	1886.	No. *422.	Year	1893.	No. 719.	Year	1900.
*415	“	1887.	*555	“	1894.	719a	“	1901.
*416	“	1888.	*577	“	1895.	813	“	1902.
*417	“	1889.	*612	“	1896.	861	“	1903.
*418	“	1890.	623	“	1886-96.	896	“	1904.
*419	“	1891.	640	“	1897.	924	“	1905.
*420	“	1886-91.	671	“	1898.	981	“	1906.
*421	“	1892.	686	“	1899.			

Mineral Resources Bulletins:—

No. *818. Platinum.
851. Coal.
*854. Asbestos.
857. Infusorial Earth.
858. Manganese.
859. Salt.
No. 860. Zinc.
869. Mica.
872. Molybdenum and Tungsten.
*877. Graphite.
880. Peat.
No. 881. Phosphate.
882. Copper.
913. Mineral Pigments.
953. Barytes.
984. Mineral Pigments. (French).

Reports of the Section of Chemistry and Mineralogy:—

No. *102.	Year	1874-5.	No. 169.	Year	1882-3-4.	No. 580.	Year	1894.
*110	“	1875-6.	222	“	1885.	616	“	1895.
*119	“	1876-7.	246	“	1886.	651	“	1896.
126	“	1877-8.	273	“	1887-8.	695	“	1898.
138	“	1878-9.	299	“	1888-9.	724	“	1899.
148	“	1879-80.	333	“	1890-1.	821	“	1900.
156	“	1880-1-2.	359	“	1892-3.	*958	“	1906.

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* Publications marked thus are out of print.

REPORTS.

GENERAL.

745. Altitudes of Canada, by J. White. 1899.

*972. Descriptive Catalogue of Minerals and Rocks, by R. A. A. Johnston and G. A. Young.

1073. Catalogue of Publications: Reports and Maps (1843-1909).

1085. Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.

1086. French translation of Descriptive Sketch of the Geology and Economic Minerals of Canada, by G. A. Young, and Introductory by R. W. Brock. Maps No. 1084; No. 1042 (second edition), scale 100 m. = 1 in.

1107. Part II. Geological position and character of the oil-shale deposits of Canada, by R. W. Ells.

YUKON.

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1144. Reprint of Summary Report on the Serpentine Belt of Southern Quebec, by J. A. Dresser.

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MAPS.

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